

REMARKS

Claims 1-8 and 21 are pending in the present application. In the Final Office Action mailed August 16, 2006, the Examiner rejected claim 21 under 35 U.S.C. §102 (b) as being anticipated by LeRoux et al. (USP 5,345,176) “LeRoux.” The Examiner next rejected claims 1-5 and 7 under 35 U.S.C. §103(a) as being unpatentable over LeRoux in view of Alsop’s The Sensitivity of Low Flip Angle RARE Imaging “Alsop.” Claim 6 is rejected under 35 U.S.C. §103(a) as being unpatentable over LeRoux in view of Alsop, and further in view of Loncar et al. (USP 6,252,400) “Loncar.” Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over LeRoux in view of Alsop, and further in view of Stuber et al. (USP 6,230,039) “Stuber.”

Regarding claim 1, the Examiner stated that “amended claim 1 is withdrawn from consideration as being directed to a non-elected invention, and claim 1 filed on (sic) will be prosecuted in the present Office Action.” Accordingly, it appears the Examiner has refused to enter Applicant’s amendment and therefore claim 1 is listed in its “original” form. Applicant will pursue prosecution of original claim 1 and seeks reconsideration in accordance with the arguments presented below.

The amendments to claims 3 and 4 from the response of June 21, 2006 remain.

35 U.S.C. §102 Rejections

The Examiner rejected claim 21 under 35 U.S.C. §102 (b) as being anticipated by LeRoux. Claim 21 calls for, in part, a computer programmed to determine, in real-time, a respective flip angle for each data acquisition pulse of a pulse sequence for multi-echo acquisition of MR data matched to a given target tissue and a given scan prescription to reduce ringing artifacts from amplitude decay of the multi-echo acquisition wherein the computer is further programmed to determine the respective flip angle from a selection of one of a number of stored polynomial expressions of available flip angle trains, the selected polynomial expression being most optimal of the number of stored polynomial expressions for the given target tissue and the given scan prescription.

LeRoux describes a technique for altering the nutation angles in successive RF refocusing pulses in order to stabilize the early NMR echo signals without exceeding the RF power capabilities of the NMR system. *LeRoux, Col. 3, lns. 27-29*. It is accomplished by “deliberately under stabilizing the first NMR spin-echo signal such that its RF refocusing pulse can be produced in a short time interval with the available RF power.” *Id. Col. 3, lns. 30-34*.

LeRoux illustrates a rate of decay by dashed line 315 in NMR spin echo signals 301-304. *Id. Col. 7, lines 23-25*. LeRoux goes on to say that “the T2 decay in the NMR spin echo signals

301-304 is illustrated by the dashed line 315,” and the “rate of decay is different for different tissue types.” *Id. Col. 7, lns. 23-26*. LeRoux teaches that the NMR echo signals 301-304 do not decay smoothly along dashed line 315 and “the magnitude of the NMR signals 301-305 may oscillate significantly below this optimal T2 decay curve 315” *Id. Col. 7, lines 45-49*. LeRoux illustrates the oscillation effect in Figure 4 where, for a high tip angle of 180 degrees the oscillation “does not arise,” but when the tip angle is reduced below 180 degrees, the oscillations in the early NMR signal magnitudes become very significant. *Id. Col. 7, lns 56-63*. Furthermore, “[a]s the tip angle is further decreased, more NMR echo signals are affected before an equilibrium condition is reached, but oscillations become less pronounced.” *Id., Col. 7, lines 60-66 and Fig. 4*. LeRoux states that “an objective of the present invention [is] to produce selective RF refocusing pulses which will eliminate such oscillations in the NMR echo signals for all spins in the excited slice.” *Id., Col. 8, lines 9-12*.

Thus, LeRoux discloses an NMR system with pulse control means in which a series of NMR signals are stabilized from oscillation, the effect of which is illustrated in Figure 4 of LeRoux. However, the NMR signals decay along “optimal” curve 315. Additionally, although LeRoux acknowledges that the “rate of decay is different for different tissue types,” the corrective measures taken to stabilize from oscillation are not matched to a given tissue type. Finally, LeRoux teaches a method that decays along curve 315, thus the ringing artifacts from amplitude decay are not addressed by LeRoux.

LeRoux fails to disclose a computer programmed to determine a respective flip angle for each data acquisition pulse of a pulse sequence for multi-echo acquisition of MR data matched to a given target tissue and a given scan prescription to reduce ringing artifacts from amplitude decay of the multi-echo acquisition.

Accordingly, that which is called for in claim 21 is not taught or suggested in the art of record. As such, Applicant believes claim 21 is patentably distinct over the art of record.

35 U.S.C. §103 Rejections

The Examiner rejected claims 1-5 and 7 under 35 U.S.C. §103(a) as being unpatentable over LeRoux in view of Alsop. Claim 1 calls for, in part, a computer programmed to determine, in real-time, a respective flip angle for each data acquisition pulse of a pulse sequence for multi-echo acquisition of MR data matched to a given target tissue and a given scan prescription to reduce ringing artifacts from amplitude decay of the multi-echo acquisition.

LeRoux is described in detail above. LeRoux fails to teach or suggest at least two elements of claim 1, namely determining a respective flip angle for each data acquisition pulse of

a pulse sequence for multi-echo acquisition of MR data matched to a given target tissue and, reducing ringing artifacts from amplitude decay of the multi-echo acquisition. Accordingly, that which is called for in claim 1 is not taught or suggested in the art of record. As such, Applicant believes claim 1, and the claims which depend therefrom, are patentably distinct over the art of record.

The Examiner rejected claim 6 under 35 U.S.C. §103(a) as being unpatentable over LeRoux in view of Alsop, and further in view of Loncar. The Examiner also rejected claim 8 under 35 U.S.C. §103(a) as being unpatentable over LeRoux in view of Alsop, and further in view of Stuber. However, because Applicant believes that claims 6 and 8 depend from what is otherwise believed an allowable claim, no further arguments are necessary.

Further, Applicant believes that claims 9-20 also define over the art of record and claims 9-20 should be rejoined. Therefore, in light of at least the foregoing, Applicant respectfully believes that the present application is in condition for allowance. As a result, Applicant respectfully requests timely issuance of a Notice of Allowance for claims 1-21.

Applicant hereby authorizes charging of Deposit Account No. 07-0845 for any additional fees associated with entering the aforementioned claims.

Applicant appreciates the Examiner's consideration of these Amendments and Remarks and cordially invites the Examiner to call the undersigned, should the Examiner consider any matters unresolved.

Respectfully submitted,

/Timothy J. Ziolkowski/

Timothy J. Ziolkowski
Registration No. 38,368
Direct Dial 262-376-5139
tjz@zpspatents.com

Dated: October 16, 2006
Attorney Docket No.: GEMS8081.228

P.O. ADDRESS:

Ziolkowski Patent Solutions Group, SC
14135 North Cedarburg Road
Mequon, WI 53097-1416
262-376-5170